NARAC

National Atmospheric Release Advisory Center

Overview

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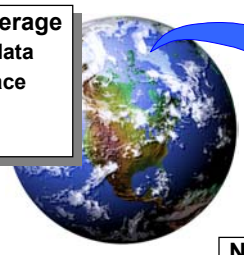
National Atmospheric Release Advisory Center (NARAC)

Real-time advisories for hazardous atmospheric releases

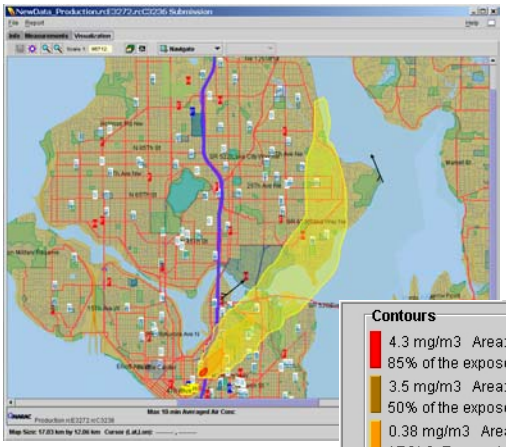
World-wide data coverage
- Real-time weather data
- Terrain & land surface
- Maps
- Population



National Center at LLNL
- Advanced, automated 3-D plume model relocatable anywhere in the world in real-time
- Scientific and technical staff provides training, assistance and analysis 24 hrs x 7 days

Real-time 3-D Plume Model Predictions
- Nuclear, radiological, chemical, biological releases
- Plume predictions available within minutes using Internet/Web tools
- Standalone simple plume modeling tools on end user's computer
- Geographical information displays
- Affected population, health risks, recommended actions

NARAC Products



- Plume contours of health effects or Protective Action Guidelines
- Affected population
- Map features
- Wind data

Contours

4.3 mg/m3 Area: 0.038 sq km Population: 30
85% of the exposed population could receive a lethal dose.

3.5 mg/m3 Area: 0.046 sq km Population: 30
50% of the exposed population could receive a lethal dose.

0.38 mg/m3 Area: 0.378 sq km Population: 3356
AEGL3: Exposed population could experience life-threatening effects.

0.087 mg/m3 Area: 1.450 sq km Population: 7482
AEGL2: Population could experience serious long-lasting effects.

0.0069 mg/m3 Area: 15.249 sq km Population: 33001
AEGL1: Exposed population could experience notable discomfort.

NARAC is a "Full-Service" Asset for Federal Government

- **Real-time advisories for hazardous atmospheric releases**
  (Nuclear, radiological, chemical, biological & natural releases)
- **State-of-the-science modeling system for atmospheric dispersion plume prediction and effects**
- **State-of-the-technology communications using Internet- and web-based systems**
- **Operational readiness of NARAC Center**
  - **Weekly communications tests**
  - **Maintain centralized modeling system hardware, software and databases**
- **Customer support from expert scientific staff for planning, emergency response, recovery and post-event analyses**
- **Customer support services for end-user tools**
  - **Maintain, troubleshoot and upgrade end-user software tools**
  - **Maintain site-specific data bases**
- **User training and regular exercises with each supported organization**

Agency Relationships

On-line Sites:
- **DOE**
- **DOD**
- **NR**

Supported Programs:
- **Atmospheric Release Advisory Capability (ARAC)**
- **Accident Response Group (ARG)**
- **Chemical Biological National Security Program (CBNP)**
- **Federal Radiological Monitoring & Assessment Center (FRMAC)**
- **Nuclear Emergency Support Team (NEST)**
- **Radiological Assistance Program (RAP)**

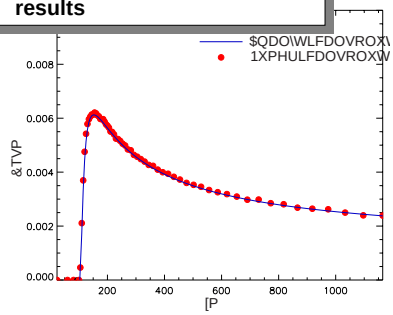
Advisory Services:
- **DOD**
- **DOS**
- **DTRA**
- **EPA**
- **FAA**
- **FBI**
- **FEMA**
- **NRC**
- **States**

Weather Data Suppliers:
- Air Force Weather Agency **(AFWA)**
- **Fleet Numerical Meteorology and Oceanography Center (Navy/FNMOC)**
- National Weather Service **(NOAA/NWS/NCEP)**
- Regional networks
- On-line Sites

New Projects Provide NARAC support to Local and State Agencies for Homeland Defense

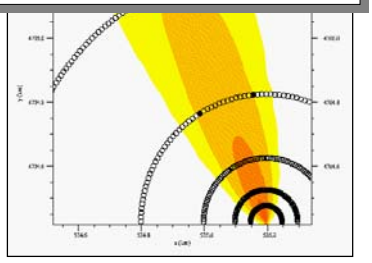
NARAC Model Testing, Evaluation & Application

- **Analytic solutions test models versus known, exact results**



- **Field experiments test models in real-world cases**

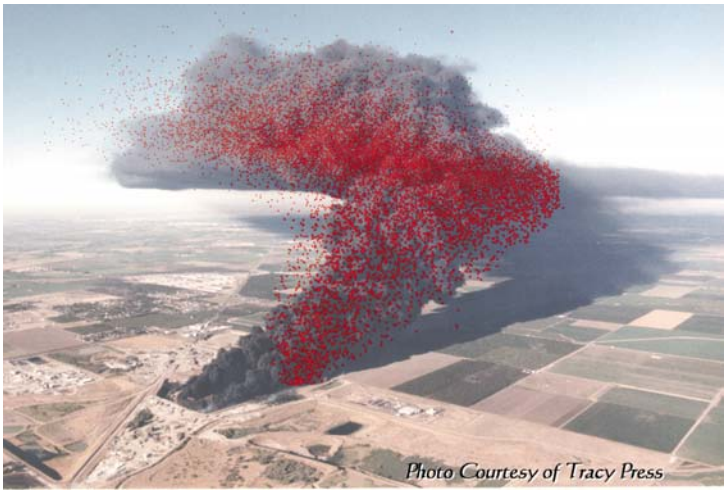
Examples: Project Prairie Grass, Savannah River Mesoscale Atmospheric Tracer Studies, Diablo Canyon Tracer Study, ETEX, URBAN



- **Operational applications evaluate the usability, efficiency, consistency and robustness of models for operational conditions**

Examples: Chernobyl, Kuwait oil fires, tire fires, industrial accidents, Algeciras Spain Cesium release, Tokaimura criticality accident, Cerro Grande (Los Alamos) fire, post Sept 11 threats

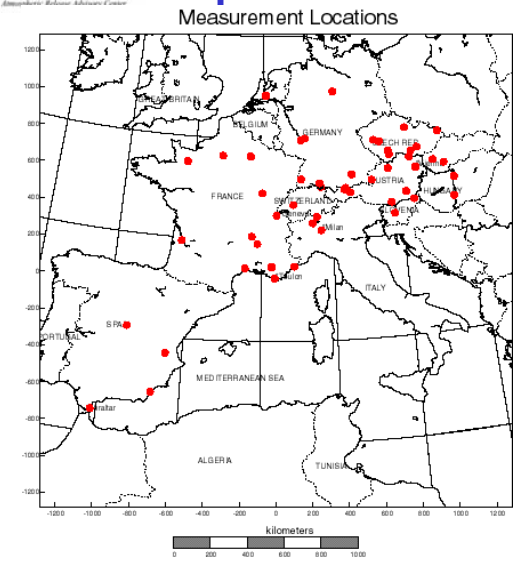
NARAC Simulation of Tire Dump Fire



Tracy, California
August 7, 1998

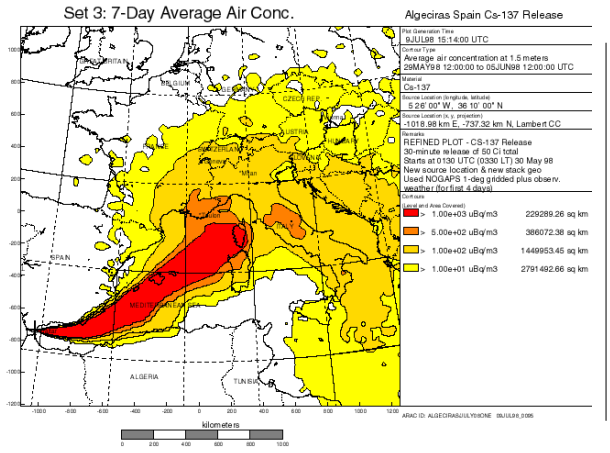
Photograph of smoke plume with NARAC-simulated smoke particles (in red)

NARAC Responded to Algeciras, Spain Cesium Release

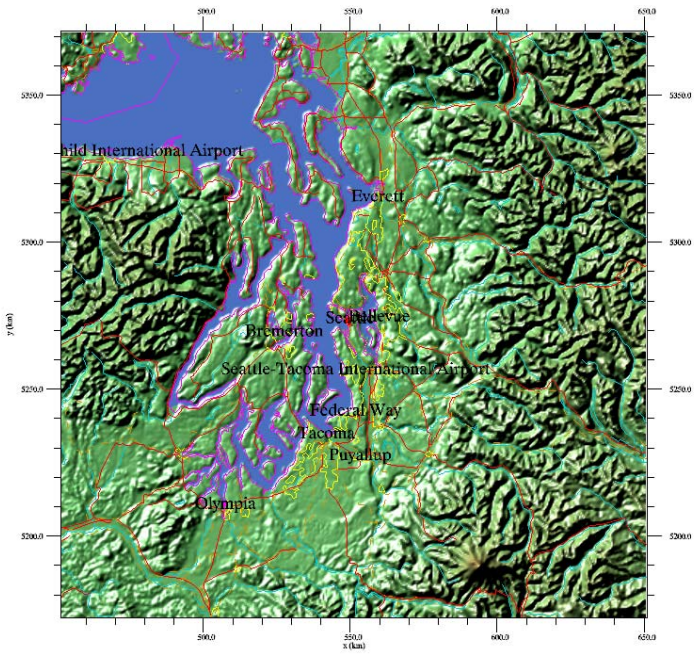


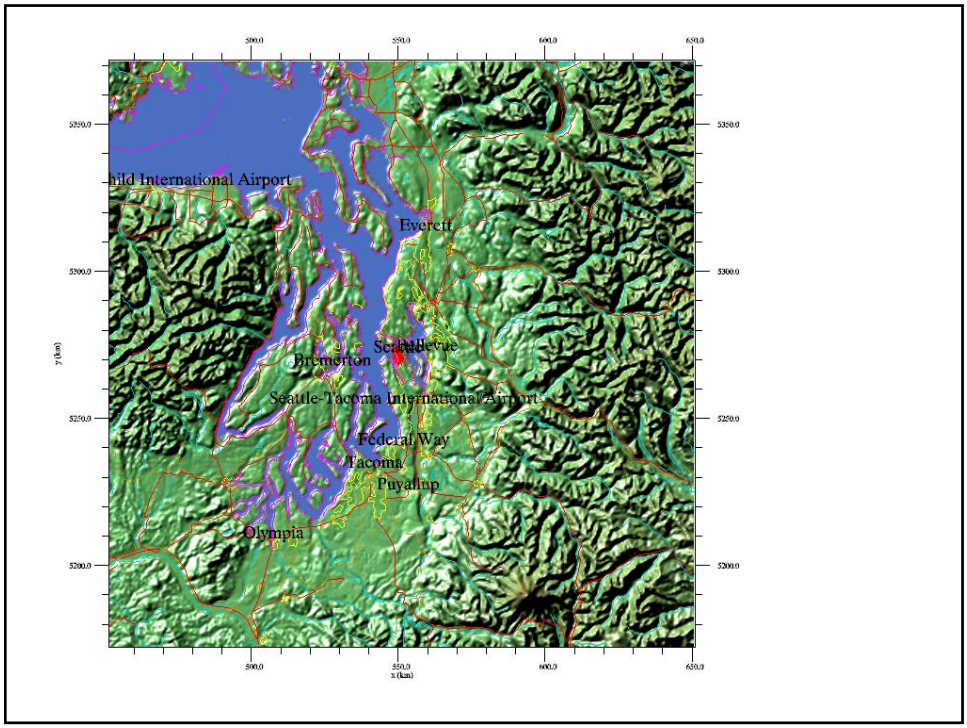
European Sampler Network Detected Low Levels of Radioactivity
May-June, 1998

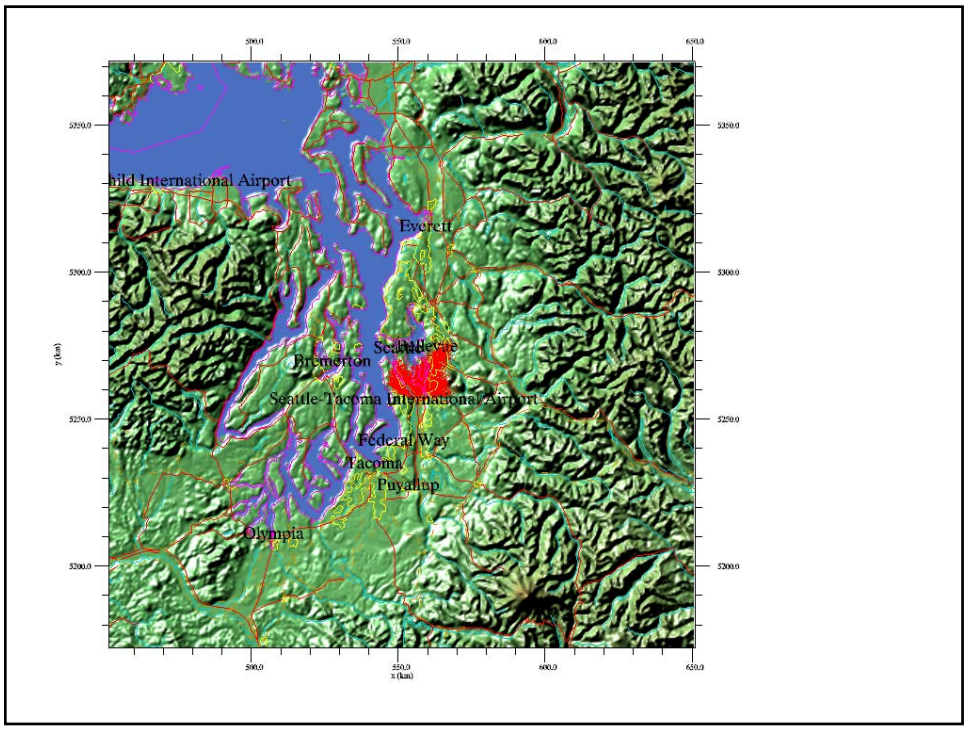
Algeciras Event Reconstruction and Analysis



Cesium-137 Release
Algeciras, Spain
May-June 1998




hild International Airport
Everett
Bremerton
Seattle-Tacoma International Airport
Federal Way
Tacoma
Puyallup
Olympia
y (km)
x (km)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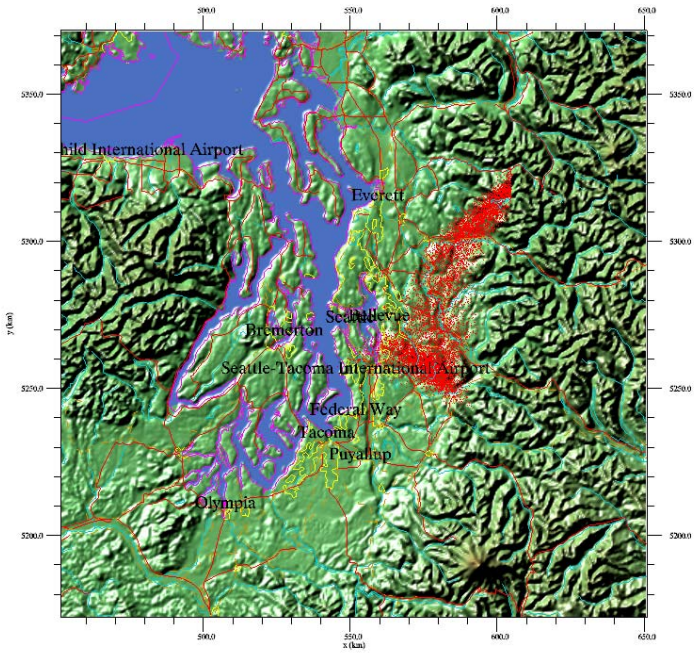


Application and Web-based Tools

NARAC

NARAC provides automated model execution

NARAC also provides staff-supported detailed analyses in real-time

NARAC Web
Web-based tools to easily obtain and display NARAC plume prediction and *share* with other users

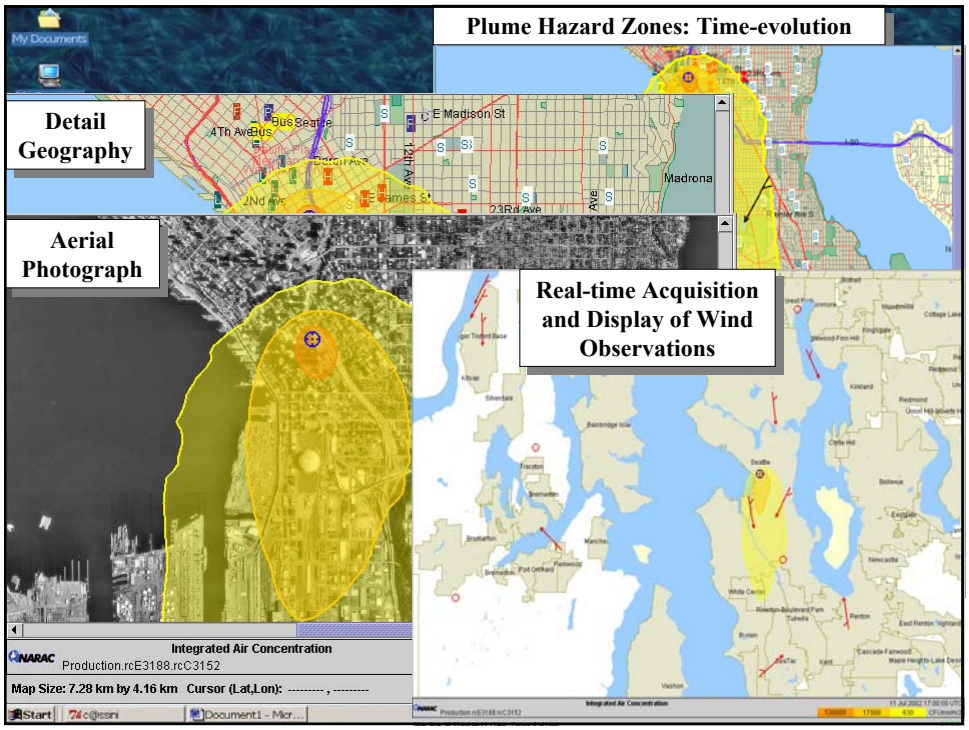
NARAC iClient
Advanced application tools to obtain and display NARAC and standalone plume model predictions

Middle Tier

Internet, Intranet & dial-up

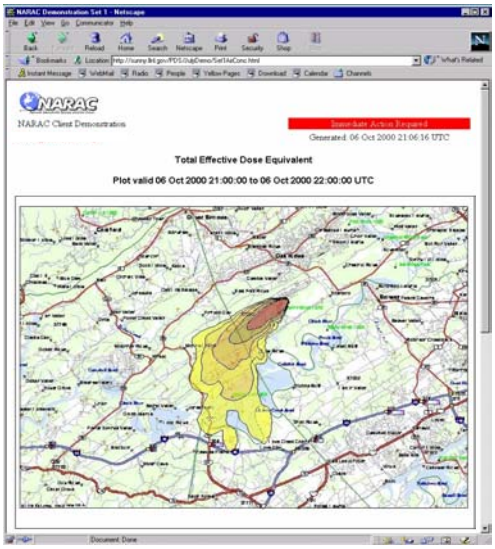
Internet, Intranet & dial-up

Information sharing between collaborating agencies



NARAC Web

- Use standard Web browser
- Real-time weather data and plume predictions
- U.S.-wide high-resolution maps
- High-level of security and encryption (password controlled access)
- Web server designed for high-capacity
- Sharing of predictions with other users or groups of users



The Secretary of Energy's Commitment to the States

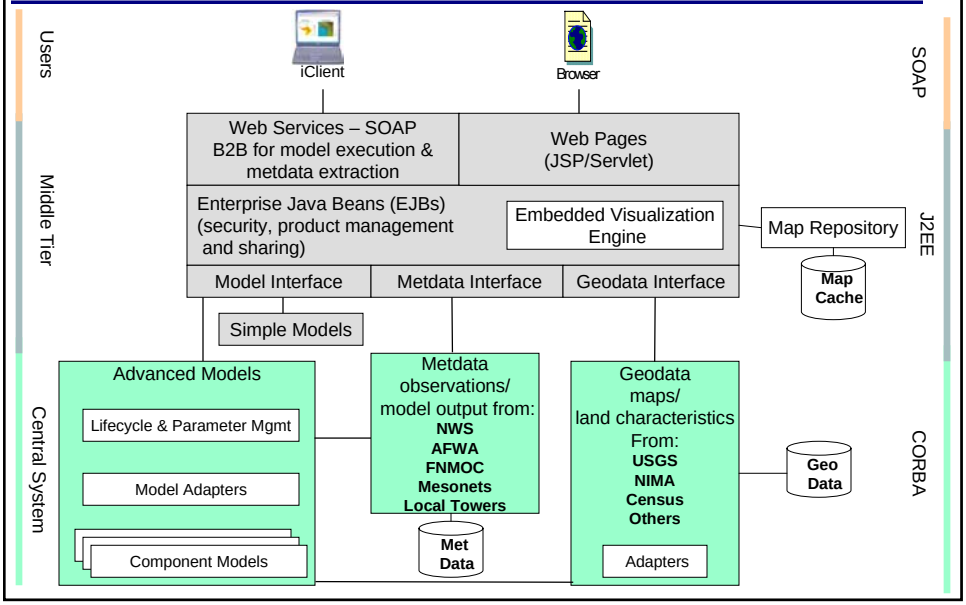
- ❑The Secretary of Energy offered NARAC services to state and local officials:
  - To respond to any terrorist event involving nuclear, chemical or biological material
  - To respond to nuclear power/fuel plant accidents with offsite consequences
  - To respond to major HAZMAT accidents
- ❑Initial access via 24-hr phone numbers and distribution of predictions via Web page
- ❑Develop interactive Web site to make requests and receive automated products

LINC Program is Demonstrating NARAC Support for Pilot Cities

- ❑Initial installation, configuration of network and firewalls, and testing of the iClient laptop software, was successfully completed in the Seattle
- ❑Access to additional, special meteorological sensors being developed
- ❑Initial users successfully trained
- ❑Ongoing testing and integration with city, as well as state and federal, emergency response plans and procedures

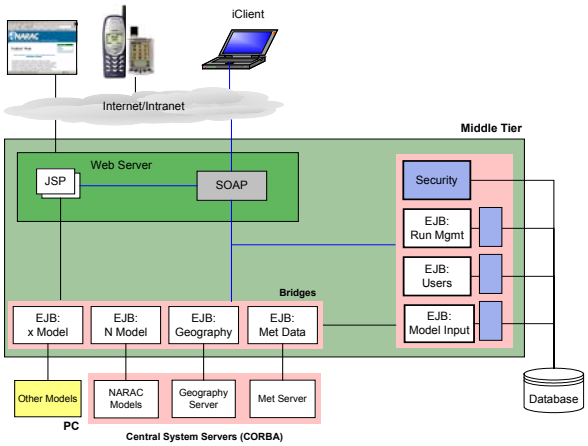
Seattle

NARAC Architecture



Middle Tier Architecture

- ❑ **Components**
- ❑ **Isolation**
- ❑ **Scalable**
- ❑ **Fault Tolerance**
- ❑ **Load Balancing**
- ❑ **Multi-Device Support**
- ❑ **Standards Based**



Technologies & Standards in NARAC

- ❑ Central system
  - CORBA
  - Java, C++, FORTRAN 90
  - Object Database
  - UNIX
- ❑ Middle tier
  - Java/J2EE
  - Relational Database/JDBC
  - SOAP
- ❑ Transport
  - XML (problem description, metdata, plumes, field measurements)
  - NetCDF
  - Streams for bulk data
- ❑ Interoperability
  - Current:
    - ESRI shape or custom representations of plumes
    - limited exposure of SOAP interfaces for models and metdata
  - Future: extend to other standards (SVG, GML,WSDL,WML,JCE,…) as appropriate

NARAC is an extensible suite of tools for emergency management

Models	State-of-the-art atmosphere modeling system	HOME
Databases	Global, detailed meteorology and geography	
Support	Multi-disciplinary expertise	
Web Access	Web, browser based for simplicity and accessibility	REMOTE
Rich Client	iClient, an application w/ visualization, input ctrl, local models	
Mobile Client	Wireless access for mobile users, WAP/WML, J2ME (*future*)	

An enterprise tier for integrated emergency collaboration

- Security and access control to NARAC resources and partners
- Personalized, tailored response to customer needs
- Provides scalable and reliable access
- Supports multiple atmospheric dispersion models
- Access point to shared emergency resources